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S U R G I C A L

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P H Y S I O L O G I C A L

E S S A Y S,

B Y

JOHN ABERNETHY,

PROFESSOR OF ANATOMY TO THE CORPORATION OF SURGEONS;
ASSISTANT SURGEON TO ST. BARTHOLOMEW'S HOSPITAL;
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Vol. I.

*Proas abscep.
Essay on Animal
Matter.*



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D E D I C A T I O N.

T O

MR. CHARLES BLICKE,

SURGEON OF ST. BARTHOLOMEW'S HOSPITAL.

S I R,

TO your instructions I am indebted for a considerable portion of that surgical knowledge which I possess: to your friendly exertions, I in a great measure, owe the situation of life in which I am placed. I should think myself equally ungrateful, and unjust, not to acknowledge these obligations, when an opportunity is afforded me by the presentation of these writings to your notice. I forbear to attempt any eulogium either on the good qualities of your mind, or on your professional talents; for to your friends the account were superfluous, to yourself it might

not

not be pleasing, whilst by those who know you not, it might be regarded merely as the accustomed language of dedication.

My chief design in this brief address therefore is, publicly to avow my obligations to you, and publicly to testify *my great respect* for your abilities as a surgeon, and *my great esteem* for your character as a man.

I am, SIR,

Your obliged and obedient

friend and servant,

JOHN ABERNETHY.

P R E-

P R E F A C E.

I SHOULD think myself deficient in the respect due to the public opinion, were I to permit these Essays to appear, without offering an apology for their imperfections, and defects. The reader will perceive the reasons which led me to wish the speedy publication of the first Essay; they have induced me to print it, at a time when my other occupations, prevented me from paying the requisite attention to correctness. I was prompted to undertake the experiments contained in the second Essay, because it appears necessary to introduce a course of anatomical lectures, with a philosophical account of the nature of the matter, which composes an animal body.

I design

I design to submit two other papers to the public consideration; but I shall defer their publication until the summer, when I shall have more leisure to perfect them.

the practitioner of the necessity of attending to these minutiae, and also to lay before the public the information which I have derived from my present degree of experience in these diseases.

Whilst the condensed cellular substance which forms the cyst of an abscess remains entire, it continues free from inflammation, and the contained pus suffers no putrefaction nor evident alteration of quality. Some lumbar Abscesses contain two quarts or more of matter. The surface of the containing cyst must in such cases be very extensive: whenever the abscess is opened either by ulceration, or by the hand of the surgeon, a sudden and generally considerable inflammation extends itself over the whole cyst; this is followed by a copious discharge of frequently fætid pus. Now this immediate inflammation and consequent discharge cannot but greatly derange and exhaust the constitution of the patient, which is generally irritable, and already much enfeebled by the efforts attending the formation of the disease.—It is well known that when we evacuate fluids from the cavities of the body, if we immediately close the

aperture through which they were discharged we prevent the inflammation which would otherwise ensue. The evacuation of water from the abdomen, and Tunica vaginalis Testis may be adduced as instances of the truth of this remark. It is also well known, that if the matter of an abscess be discharged, its cavity becomes much diminished by the contraction of its cyst. It will hereafter be shewn that this contraction will be greater in chronic lumbar abscesses than in those of a more phlegmonoid nature, since in the former the cyst having sustained less inflammation and undergone less alteration of structure, will be more likely to possess and exert its natural elasticity, and thus greatly diminish the cavity of the abscess.

On these two observations the practice hereafter related is founded; it occurred to me that if after the evacuation of a lumbar Abscess, the aperture were directly closed and its immediate union procured, that no inflammation of the cyst would follow, which being now relieved from pressure would by its contraction and rarefaction greatly diminish the cavity:

the pus, doubtless, would speedily reaccumulate, yet I thought by repeatedly evacuating this fluid before distention of the cyst could happen, the cavity would be so much reduced, and the cyst be made so much less extensive, that the future admission of air would be productive, comparatively, but of little consequence. Such were the sentiments excited in my mind by some of the following cases, and such were the motives which induced me to pursue the practice hereafter related.—I shall first give an account of the cases as they occurred, and afterwards offer some general observations on these diseases. To the account of each case I will annex those remarks which it suggested, and which I am unwilling to postpone to the conclusion, as they would less forcibly strike the mind of the reader if the circumstances which gave rise to them were held but imperfectly in remembrance.

C A S E.

A young man, about twenty-seven years of age, of a muscular form, and healthy constitution, came from the country to the

hospital, to obtain relief from a collection of matter which presented itself in the upper and fore-part of the thigh, beneath the Fascia, and immediately below Poupart's Ligament. The pain which he had previously suffered in his loins, and the impulse of matter into the tumour upon his coughing, left little doubt of the original seat of the disease. The Fascia of the thigh had yielded considerably to the collected pus, so that it did not descend so low as is common, but appeared very prominent. Although he had endured considerable pain, he had not suffered much from fever on the first formation of the abscess.

A caustic was applied on the tumour to give discharge to the matter, and three days afterwards the eschar was divided.—Eight ounces of very perfectly formed, moderately consistent, and inodorous pus issued from the incision.—The sides of the eschar now closed up the wound and prevented any further evacuation of matter. This the surgeon did not attempt to produce, thinking the delay would be useful.

For three days no more fluid was evacuated, during which time the young man remained perfectly well, and his thigh free from inflammation.—On the fourth day the eschar became so much loosened in its circumference that part of it gave way, and eight ounces more of similar and perfectly inodorous pus was discharged. In twelve hours after this detachment of the eschar, he suffered much from fever and pain in the part, and the discharge became putrid. In two days the fever, which was of the hectic kind, seemed to be established, and from the sore there flowed a copious and increasing quantity of foetid pus. His skin was now hot, his face flushed, he sweated profusely in the night, his appetite failed him, his pulse beat 120 in a minute, his tongue was but little altered from its natural appearance, he had no sleep, and was distressingly restless.—These symptoms continued about a week without cessation, they then appeared slightly to remit, and proceeded for three weeks in the same manner, with some little diminution in their severity; his strength was now greatly exhausted, the discharge from the abscess very profuse, and in this state it

was thought right to have him conveyed into the country, where I am informed he gradually declined, and in about six weeks more he died.

This case first suggested to me the propriety of closing the opening after the discharge of the pus; for until the continuity of the cyst of the abscess was destroyed by the separation of the eschar, the part was uninflamed and the state of the circulation unaltered. The sudden inflammation and fever which followed the separation of the eschar, in my opinion, prove the ingress of air into the cavities of abscesses to be injurious. Whether this be admitted or denied, it is however sufficiently evident from this case that a large opening and much irritation of the cyst or such an abscess, is productive of the most detrimental consequences to the constitution of the patient.

That mode of treatment which causes least irritation I believe has ever been found the most successful. But whenever a permanent opening has been left in a large abscess,

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generally considerable and frequently fatal, irritation hath ensued.

It will, however, be evident in the following cases that the reduction of the abscess to an inconsiderable extent has been accomplished, without the occurrence of any local inflammation, or general fever.

C A S E.

July 1790. John Tucker was admitted into St. Bartholomew's Hospital on account of a Psoas Abscess: His health had been declining for more than three years. He had for a considerable time been an out-patient under the care of Dr. Austin, who had unavailingly endeavoured to prevent the formation of this abscess by issues made in his back, and by the administration of various medicines. He had suffered greatly from pain in his loins and fever: the abscess was very large and had descended very low on the inside of the thigh, the integuments covering it were natural, the impulse of matter into the tumour upon coughing very considerable.

His pulse was feeble and beat eighty-six in a minute, previous illness had exhausted his constitution ; he had a constant cough, and undoubtedly much diseased lungs.—He had little appetite and was of a costive habit—he was of fair complexion, light hair, and blue eyes, and his countenance frequently flushed :—He was on all these accounts as unfit a subject, as can well be supposed, to encounter the derangement of constitution, which must succeed to the ordinary evacuation of the abscess.

On Wednesday the 28th of July, I tapped the abscess with a small hydrocele trochar and discharged three pints of pus of good quality, although in a small degree more fluid than common. I dressed the part with considerable caution. I moistened the lint which I applied to the orifice with *tinctura benzoës composita*, over this I applied some sticking plaster, which was retained by cross slips, and afterwards varnished over with gum ; some compresses of linen were applied over the abscess, and gently bound on by a flannel roller.

On

On Thursday, there was no very perceptible difference in his health—he had slept and eat as usual, his tongue was moist and natural, his pulse a few strokes quicker.

On Friday, he said, that he found his loins relieved by the evacuation, that he could perceive no difference in his health, and his pulse was the same as before the operation. For many days his health remained unchanged, he became he thought a little weaker, and the frequency of his pulse had increased about four strokes in a minute. For this little alteration we could readily account, knowing that some fluids were drained from the circulation into the cavity of the abscess, and that some little exertion of the system would necessarily ensue.—The abscess remained without pain, or inflammation, and his constitution free from fever; his skin continued in its natural state, his appetite was good, his sleep sound, and his countenance unaltered. Three days after the operation I removed the dressings from the punctured part, it appeared healed, I however carefully renewed the dressings every third day.

Friday,

Friday, the 13th of August, sixteen days after the first discharge, the tumour having become prominent, I again punctured it and evacuated its contents. I knew the discharge would encrease his weakness, yet, if the collection were suffered to remain it would shortly distend the cyst to its former dimensions, and my original plan of treatment would be frustrated.

The quantity of the discharged fluid was nine ounces ; in appearance and chemical properties it much resembled blood. This bloody effusion was probably the consequence of laxity of the exhaling vessels, as there had not been the least expression of inflammation in the abscesses. Before I discharged the matter the second time he complained of some pain in his loins ; but the following day he said he was much relieved, and found himself remarkably well. This second puncture was dressed like the former and quickly healed.

During the time which had elapsed between the first and second discharge, he had not been confined even to the ward, but often went

went from the hospital to see his friends. This his cough, the weak state of his health, his disinclination to live in the hospital, and the obvious impunity with which it was done, induced me to permit. After the second evacuation he altogether lived with his friends, promising to come every week to let me see the state of his complaint ; however, the second week when the matter ought the third time to have been evacuated, he failed in his promise. I was now obliged to leave London for some time, so that I did not see the patient again until September the 8th, which was four weeks and five days from the former evacuation ; he had refused to have the matter let out during my absence.. I now discharged in like manner ten ounces of lymphatic exhalation, rather dark coloured and turbid, as if mixed with true pus. The man, during the last week, had complained of pain in his loins and in his knee, both of which were relieved as usual by the operation.

Before the abscess was first opened the impulse of matter from the loins, on coughing,
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was extremely forcible, but was now not at all perceptible. It appears to me that a very considerable advantage is derived from this mode of treating these complaints. Whatever secretion is made in the abscess of the loins, will, by its gravity, descend into the space left by the seceded fascia of the thigh. The abscess of the loins being left perfectly free from distention will most probably contract to very little dimensions, if it be not perfectly abolished. Hence in the subsequent treatment of these complaints you have only to attend to the disunited fascia; whilst the cavity in the loins scarcely deserves notice.

September 22d; a fortnight after the former evacuation, I discharged four ounces of similar serous fluid mixed with pus. During its evacuation, which was very speedy, I had applied my fingers beneath Poupart's ligament, as if to obstruct the descent of any matter from the loins. I then desired the man to cough, but no matter descended, and the collection appeared to me entirely confined to the thigh.

I found

I found some difficulty in introducing a trochar, when the abscess contained so little fluid. This was remedied by first introducing a lancet through the fascia, and then conveying the trochar through the aperture made by the lancet.

Thus after discharging the matter four times, the complaint was reduced from a lumbar abscess, containing three pints, to a small collection of matter beneath the fascia, containing four ounces.—What communication this had with the loins, and what was the state of parts there, cannot be determined. To appearance there was no collection. If I had now immediately opened the abscess, the containing cyst being small, the inflammation probably would not have been considerable. But the state of the man's health induced me for a short time to defer this final attempt, this radical cure, as I may express it, and be contented with only evacuating the matter when collected, without suffering the collection to increase the size of the cyst. It might be expected, by repeating the evacuation, that the cavity would diminish to

its

its total abolition. This would probably happen were the abscess in the cellular substance; but the inelastic fascia cannot contract, and the subjacent muscles cannot be elevated, so that the effused matter, though very small in quantity, would still preserve them disunited.

I had let out four ounces of matter once in October, and on the 5th of November I opened the abscess by an incision about an inch and a half in length at the lower part. I introduced my finger beneath the fascia as high as Poupart's ligament, I desired the patient to cough, but no matter descended from the loins, neither could I ascertain any communication. The extent of the detached fascia was about four inches and a half in length, and nearly four in breadth. The cyst inflamed after opening. The hardness and quantity of the discharge increased for four days and then gradually subsided. His thigh was stiff and sore, so that he could not easily move it, but he had no particular pain in his loins—his pulse did not vary—his tongue was not furred—his sleep was not interrupted—nor could any derangement of his health be perceived.

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Granulations grew from the edge of the incision, and the opening nearly closed and afforded scarcely any discharge.—Yet, on introducing a probe through the orifice, I found that the fascia remained disunited. With a view to produce an union, by exciting inflammation, I introduced a seton from this lower orifice to the upper part of the cyst. The fascia again inflamed, indurated, and united, only the track of the seton was unclosed ; and this by the injection of some spirit and water, was also soon induced to fill up. In discoursing with the patient, after opening the abscess, respecting his health, he said, he was ten times better than before it was opened ; that until this time he had always been subject to fits of pain, and to a state of weakness and faintness which he could not describe.

After the perfect closure of the abscess, he could extend and bend his thigh with freedom and ease ; he could also readily put his foot upon a chair set before him. This it would have been impossible for him to accomplish during the formation or continuance of the abscess. This freedom of action in the psoas

muscle indicated considerable soundness of it, and of the contiguous parts. He still, however, complained of much rheumatic pain in his hips and sometimes in his loins ; and as I supposed his constitution might be affected by the suppression of a long-continued purulent discharge, and might attempt for its relief the formation of a new abscess, I inserted two setons in the integuments of the loins, with a view of preventing inflammation of the internal parts.

They did not, however, relieve his pains ; he complained much of their inconvenience, and as he designed to go into the country, they were discontinued. I saw him about a year afterwards—no alteration had taken place in the thigh, nor no fixed pain had attacked the loins, but he was still much teized with unsettled rheumatic pains.

The preceding case was very unfavourable both from the patient's constitution and from the degree of the disease. Yet, by four times discharging the matter, which was not attended with much more pain than bleeding, it

it was reduced from a lumbar abscess, containing three pints, to a small collection beneath the fascia of the thigh, containing four ounces, and without any evident communication with the loins. Each time, instead of suffering inconvenience, he experienced relief; he had no fever, neither was he restrained from his usual occupations.

The final opening might have been sooner made, but as this was the first case in which I had pursued this practice, I was uncertain of the event and irresolutely protracted it for two months, hoping the amendment of his health. When it was opened no perceptible fever followed, and it shortly got well by the treatment which I have related.

C A S E.

Isaac Dean, thirty-seven years of age, had come from Hampshire to London, to obtain advice for a Psoas Abscess. He was admitted into the hospital under the care of the late Mr. Pitts. The account which he gave of himself was, that his business had obliged him to be much on horseback; that he

had formerly, when riding, bruised his left testis, which accident had occasioned an incurable disease of that gland; he therefore had suffered its removal about two years since in some county hospital. Since that time he had frequently suffered much pain in his loins; about eight months before his admission into the hospital he had caught cold: the pain in his loins then became more violent and constant, and much impeded the motions of his left thigh. About three months after this attack of severe pain, he perceived a tumour in the upper part of his thigh, which had gradually increased until the time of his admission into the hospital. Since the appearance of the tumour, the pain in the loins had much abated. The matter now descended about four inches beneath Poupart's ligament; and it received a forcible impulse when the man coughed. The fascia, containing the descended pus, was very prominent, and the skin covering it was more red than the rest of the integuments.

The patient's health was not unfavourable; his pulse was rather strong, beating seventy-

six in a minute, his tongue rather pale, his hair and eyes dark.

Monday, 3d of October, 1790, by Mr. Pitt's desire I introduced a trochar into the lower part of the tumour, and gave discharge to twenty-four ounces of pus, moderately tenacious, and containing some flakes of firmer matter: I cautiously closed the orifice, as in the former case, applied a compress, and bound it moderately tight with a roller.

I could not in this case perceive any alteration in the man's health deserving to be recorded, except that the pulse was a little quickened: he eat and slept as usual.

I carefully took off the sticking-plaister at the end of three days, and renewed a similar dressing. On Thursday, 13th of October, the abscess was now again prominent, and the puncture made by the trochar seemed slightly inflamed. As I concluded the distention of the fascia caused this inflammation, and supposing that if the pressure of the matter from beneath was suffered to continue, it might

occasion it to ulcerate, I determined to prevent this effect by again evacuating the matter. This I accomplished by passing a trochar into the lower part of the abscess, at some distance from the former opening; and by this means discharged between eight and nine ounces of pus, thinner and rather darker coloured than the former, but not tinged with blood as in the preceding case. I now carefully dressed both orifices, and again applied a bandage.

I cautiously removed the dressings, at the end of three days; the second puncture had healed, and the first had lost its disposition to inflame. After having dressed the punctured parts, and applied the bandage; I desired him to moisten it with aq. saturn. which I thought by keeping the skin cool, would prevent its disposition to inflame. The man suffered no alteration in his health from this second evacuation. On the 25th, at the end of a fortnight, the tumour being again prominent, I introduced a lancet into the fascia, and by the orifice thus made the troachar, and discharged six ouches of turbid serous fluid, and pur-

sued the same subsequent mode of treatment.

After another fortnight had elapsed the tumour was much less prominent than before, and there appeared a degree of irritation in the skin. The punctures shewed a disposition to inflame. I now desired the man to cough, but could discover no impulse of matter from the loins. This I had not before done, least the exertion should affect the punctures, which were not so firmly healed as in the former case. As the patient had not suffered much from discharge, as his health seemed fully capable of sustaining the effects arising from opening the abscess, as it was not probable that its dimensions could suffer further diminution by delay, on Friday, the 23d of November, I opened the cavity by an incision of about an inch in length, at the lower part, and immediately passed a seton through to the upper part, with a view to insure the union of the fascia.

An usual degree of inflammation of the fascia and stiffness of the affected limb fol-

lowed, but he complained of no particular pain in his loins further than general stiffness. The slight fever which accompanied seemed rather inflammatory than hectic, his pulse became a little quicker and harder, and his tongue slightly furred. These symptoms gradually abated, and at the expiration of three weeks the fascia appeared to have adhered firmly to the subjacent parts: I therefore withdrew the seton.

As he now found his health tolerably good, and being, as he thought, recovered from what he considered as a dangerous complaint, and imagining that he was made weaker by staying in the hospital, he went into the country, promising to inform me if any change happened; but I have not since heard of him. Two cases of such remarkable success, established, in my opinion, the excellence of this mode of treatment; my expectations of future success were sanguine; and although they have not been completely fulfilled, yet every succeeding case has tended to demonstrate the utility of the method.

C A S E.

July, 1791. A poor woman, fifty-three years of age, had in the beginning of March, a severe pain in her loins, which gradually abated on the appearance of a tumour on her back; this continued to enlarge until her admission into the hospital, which was in July. A small tumour was also perceived beneath Poupart's ligament. When the patient coughed, matter was forcibly impelled into both swellings; so that there was little doubt that there a lumbar abscess; the matter of which had made its way through the muscles of the back and formed the principal tumour beneath the integuments.

Friday, July 18, Mr. Earle punctured the abscess in the back with a lancet, carrying it for some distance obliquely, between the skin and the cyst of the abscess; so that the orifice of the integuments did not correspond with the orifice of the cyst: thus a kind of valve was made, which it was supposed would prevent the ingress of air into the abscess. Seven ounces of good pus was discharged, and the

the pucture was attentively dressed. The following day the abscess appeared as large as before. This confirmed the opinion that it communicated with some internal collection. On Monday it was less distended; but on Tuesday, being very full, and fearing least the pressure of the contained matter should cause an ulceration of the former orifice, I punctured the abscess as before, and discharged five ounces of thick pus; such as could not be supposed to have been formed in so short a space of time. She was not in the least disturbed in her health, and both orifices healed immediately without trouble.

The following week, on Tuesday the 2d of August, I again punctured the tumour and discharged between four and five ounces of pus. And again, on the succeeding Tuesday, I discharged in like manner three ounces of matter. On the Tuesday afterwards, as there did not appear any reaccumulation, I made an incision into the tumour of about one inch in length. About two ounces of fluid issued from the incision; the cavity of the abscess I found larger than I expected, but I could not perceive

perceive any aperture by which it communicated with the loins. On Wednesday the patient appeared well; her tongue was moist, her pulse a little more than seventy in a minute, and had a common degree of fullness and of strength.

On Thursday she was in the same state with respect to her pulse and appearance; but she was in very low spirits. She wept much, and said her back was painful, but did not otherwise complain. On Friday, business prevented me from going to the hospital, so that I did not see her. The pain in her back and the depression of her spirits had much increased; her hands were cold, and her pulse was much quickened: in this state Mr. Harvey saw her, and directed her wine and other cordials; but she soon died.

I opened the body, and it appeared, that the abscess had been originally formed on the posterior surface of the psoas muscle. This had now contracted into a kind of tubular cavity, the diameter of which was about one-sixth of an inch; and extended from nearly opposite

opposite to the last dorsal vertebra to beneath Poupart's ligament, at which place the abscess had presented itself. From the upper part of this cavity a passage was seen on the inner edge of the quadratus lumborum muscle, by which the matter had escaped from the loins through the muscles of the back, and had afterwards elevated the integuments, causing the tumour formerly described. I could not observe any appearance of inflammation on the inside of this cavity ; indeed, as only two days had intervened between the opening of the abscess and the patient's death, the time seems insufficient for the establishment of a disease of this nature.

Almost every surgeon has met with cases in which the nervous system has been so circumstanced, as to be incapable of sustaining the shock of an operation, or of attempting to remedy a disease ; and in such cases the patient has suddenly perished without any evident cause. In the present case there was nothing indicating a peculiarity of the nervous system ; the pulse was seventy, and in other respects equally natural : she was rather

ther a weakly woman, but she eat and slept as usual; every thing succeeded till the final opening of the abscess: there was every reason to suppose it was greatly reduced in size, and dissection confirmed the opinion. I know not that the event of this case could possibly be foreseen. One inference only can I draw from it, which is, that whenever any debility of constitution is perceived, one ought as long as possible to delay the final opening, or until that debility be removed.

C A S E.

February, 1791. James Leaver is in the 21st year of his age, has light brown hair, blue eyes, dilated pupils, pale countenance, frequently flushed, and is apparently of an irritable constitution. About nine months ago he was affected with a pain in his loins when he moved, which soon became very severe, even when he was at rest. This pain was accompanied with fever. Four months afterwards he perceived a small swelling in the upper part of his right thigh, which has since gradually increased, and has now descended

scended nearly to the middle of the thigh : he remarked, that he never had the least pain in the part where the tumour was formed. After the appearance of this swelling, he no longer experienced the same degree of uneasiness in his loins ; and shortly after, he acquired the power of lifting up his right thigh, which he had for some time lost.

For four months previously to his admission into the hospital, he had regularly profuse night sweats, which began about twelve o'clock, but did not prevent his sleeping ; when he awoke he found his cloaths very wet, and himself very chilly ; he had, however, an appetite for his breakfast.

On the 5th of February, Mr. Earle introduced a trochar into the most prominent part of the tumour : between two and three pints of healthy matter was evacuated, the wound was immediately closed, and lint and adhesive plaster were applied. The night succeeding the operation he slept little, but was free from perspiration. On each succeeding night he slept as usual, but had not in the least degree those

those sweats which had been constant until the discharge of the matter.

On the 8th of February, he said he found himself no worse for the operation, he was free from night sweats and slept soundly. His appetite was perfectly good, his bowels unaffected, and his tongue moist and florid. His pulse, before the operation, was ninety, and for fifteen days afterwards it varied between that and a hundred. February 15th, ten days after the evacuation, his night sweats returned, although in a less degree than formerly.

February 26th, three weeks after the first discharge, the tumour had now become nearly of its original size; the integuments were much distended; the part punctured by the trochar had for three days appeared inflamed; and on the tumour being now compressed, the cicatrix gave way, and the contained matter oozed from the orifice. The trochar was again introduced through the former orifice, and eight ounces of brownish matter discharged. The wound was carefully

fully dressed, in hopes that as the distention was taken off, it might close. After the second evacuation, the night sweats were again discontinued ; he said, he was rather weaker, but no other alteration in his health was perceived.

On the 2d of March, while in the act of coughing, the imperfectly healed wound made by the trochar, gave way. Very little pus was discharged, but as it was impossible to heal this ulcerated opening, and as the continuity of the cyst was now destroyed, the mode of treatment hitherto pursued was frustrated. Much inflammation of the cyst immediately took place, and the constitution became greatly affected. The next day, if the finger slightly compressed the abscess, it gave him great pain ; but before the cavity of the abscess became exposed, the part was perfectly indolent. When pressure was employed, a fetid, frothy matter issued from the ulcerated orifice. The cyst, however, was emptied, and, except when pressed, there was no discharge. Such were the appearances of the part. The general disturbance
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of the constitution was also very great ; his countenance exhibited strong expressions of alarm ; if any one approached him he started, and when any one touched him he trembled. His pulse beat from 130 to 140 in a minute—for two days his bowels were disordered—however, the inflammation of the cyst gradually abated, and in like manner the constitutional derangement subsided. At the end of about eight days, he was much amended, and in about six weeks the abscesses appeared nearly well, and his constitution relieved from febrile indisposition.

In this case it is clear, that the second discharge of matter was too long delayed, and to me it appears equally evident that the patient derived much advantage from the mode of treatment which had been pursued ; for by it the complaint was reduced from a large abscess, containing nearly three pints, to one which held less than eight ounces. Yet, even in this diminished state, great derangement of the constitution followed the exposure of the cavity of the abscess : indeed, I have little doubt, if the abscess had been

opened whilst it retained its original dimensions, but that the patient would have fallen a victim to the more extensive inflammation, and more violent fever, which would then have taken place.

C A S E.

Elizabeth Ridley, aged fifty-five, had for one year and a half before her admission into the hospital, suffered much from bad health, she then had a severe cough, accompanied with much fever. About ten months ago, she had a very acute pain in her loins, which abated, in some degree, ten weeks after its first attack; at that time she observed a tumour in her groin, which had gradually increased in size. The pain had been continued, though at intervals it suffered considerable abatement: the veins on the fore part of the thigh had become varicous and the leg œdematosus. The tumour was of a circular form, about four inches in diameter.—It had much protruded the fascia, and matter was violently impelled into it on coughing. She now complained of occasional pain of
her

her stomach, of failure of appetite, and a costive state of her bowels; her pulse was slow and feeble, her tongue pale, and her health considerably beneath the natural standard.

On the 8th of November, I punctured the lower part of the tumour with a lancet, carrying it obliquely about half an inch between the skin and the fascia, and discharged eleven ounces of good pus, but did not empty the abscess. The orifice of the skin and cyst did not then correspond, and on coughing there was still perceived a considerable impulse of matter from the cavity in the loins.—I was unwilling to irritate the cyst by the introduction of any instrument to separate the lips of the wound, therefore I closed the orifice with sticking plaster, and every thing remained quiet till the third day, when, by a fit of coughing, the orifice was burst open and matter oozed from beneath the plaster. If I suffered it to remain open, my original plan of treatment would be frustrated. I therefore resolved to let out the collected matter, least distention of the fascia and integuments

should prevent the wound from healing. I again introduced the lancet through the same orifice, and wounded it so as to make it bleed and gave a discharge to five ounces of pus ; the abscess though, did not even now appear to be completely emptied. I preferred to introduce the lancet through the same orifice rather than make another opening, that this new injury might excite in the divided parts a new disposition to unite. If I had not again made the separated parts bleed, they probably would have united by granulations ; their surfaces would have been for some time kept separate by a purulent secretion, and air would have been admitted into the cavity of the abscess : but the effused blood glued together these edges, and thus obstructed the aperture till its organization made the reunion perfect.

The woman suffered no evident alteration in her health, but became much easier with respect to her loins. The varicose veins and the oedema of the leg now no longer appeared. These symptoms, doubtless, originated from the pressure of her loins, occasioned

sioned by matter, of which it was very evident there was a large collection.

On the 18th, the tumour was again punctured and eight ounces of fluid evacuated. The matter before had been incompletely discharged; now I believe the tumour was entirely emptied. This last discharged matter was perfectly inodorous and the thigh uninflamed. I made this aperture at the side of the tumour with the edges of the lancet held upwards and downwards, and not transversely as the former openings had been made. This I did that the efforts employed in coughing might have less effect in impelling the matter through the orifice, which soon healed.

In the following week she complained that she was restless and could not sleep, neither had she her usual degree of appetite; her pulse, however, was not quickened, nor did any other signs of constitutional indisposition appear. No matter was now collected beneath the fascia, and after waiting another week without any apparent collection being made, on the 25th of November I intro-

duced a lancet through the fascia of the thigh, with a design to admit the air into the cavity of the abscess that remained. I did not perceive any matter issue from the opening. As the integuments covering the fascia were thickened and shewed some disposition to inflame, I directed the aqua aceti lithargyrita to be applied to them. On the following day some matter flowed through the orifice. The patient supposed, if collected it might be a table spoonful; nearly the same quantity continued to discharge for about a fortnight, and afterwards it gradually diminished, and the wound healed. She was not affected by fever in consequence of this last opening, and seemed to suffer very little inconvenience with respect to her health. She, however, complained much of pains resembling those of the rheumatism, which affected principally her hips, though sometimes they attacked her loins; for these pains she was placed under the care of the physician, and as her constitution was languid, she was recommended to continue the medicines prescribed for her as an out-patient.

In this case one circumstance appeared to me curious ; after I had twice discharged the contents of the abscess, no further collection of matter took place. Yet not because the cavity of the abscess was abolished, but because from some little indisposition of the constitution the secretion into that cavity was for a time suspended. This, however, was rather an advantageous circumstance, for as the cyst was without repletion, the contraction of the sides was unopposed.

There were also three other patients in the hospital, from whom the matter had been twice discharged, and the dimensions of the abscesses considerably diminished ; yet when the abscesses were punctured a third time, the wounds either ulcerated, or did not unite ; so that the complete reduction of the abscess was prevented. As I had not these cases under my own management, and as the plan of treatment was not perfectly executed, I shall not engross the reader's time by the relation of circumstances which do not, in my opinion, contain any useful information. The account which I have given, comprises my present experience in these complaints : in

every new undertaking unexpected circumstances will occur, which will often baffle and sometimes defeat its intention. The difficulty of uniting the wounded parts has, in some cases, frustrated the intended treatment. Particular attention is required to prevent the rupture or ulceration of the punctured parts. In one case the final opening ought to have been longer delayed: when these circumstances shall be attended to in future, there is, I think, reason to believe that our success will be more complete.

I shall now offer some general remarks on the lumbar abscesses, not, however, desiring to be systematic, or to comprehend every particular; but to notice principally those circumstances, which have a reference to the practice pursued in the foregoing cases. The remarks which I design to offer will be arranged under the following heads:

1st. I will describe the appearances of these abscesses, as I have observed them in dissection, with a view to establish my opinion of their nature.

2dly.

2dly. I will endeavour to explain the difference between these and plegmonoid abscesses.

3dly. The treatment appropriated to their different stages will be considered. The reason why these abscesses so rarely disperse, and so frequently enlarge to such extensive dimensions will be investigated.

4thly. The cause of the local and constitutional derangement which succeeds to the ordinary evacuation of the abscess will be enquired into ; and it will be attempted to be demonstrated, that the lumbar abscess is dangerous only from its magnitude.

5thly. It will be shewn, that the proposed mode of treatment reduces its dimensions to a inconsiderable extent, and proportionably detracts from the hazard of the patient.

And lastly, the principal circumstances conduced to render the treatment successful, will be stated.

It has been, I think, too prevalent an idea,

that the psoas abscess frequently is connected with and often causes a caries of the bodies of the vertebræ. This opinion requires examination. I have formerly seen many bodies opened in which these abscesses have been found. I will describe the appearances of their formation in the loins, and their progress to other parts of the body, from my own observation.

The cellular substance, interposed between the peritoneum and the loins, is the common seat of these abscesses; this substance is in greater quantity at the sides, where it connects that membrane to the psoas, and quadratus lumborum muscles, than in the middle when it attaches it to the spine. Where this substance is most abundant there most frequently are abscesses formed; and this probably is the reason why we generally find these suppurations limited to either side of the vertebræ, and seldom extending across them. If matter was formed in the middle, opposite to the bodies of the vertebræ, its gravity and the want of resistance would determine its descent to either side. As the peritoneum would readily yield to the protusion of matter collected

collected behind it ; as the cellular substance connecting it to the vertebræ would be easily separated ; so the pressure which the collected pus would make against those bones would be quite insufficient for the production of disease. The matter of such an abscess is also perfectly mild, and could not stimulate except by its mechanical properties. I therefore think it improbable that a caries of the bones should be the consequence of an ordinary lumbar abscess.

Sometimes the abscess is formed in the cellular substance behind the psoas muscle, and then perhaps it most frequently makes a passage towards the integuments of the back. This happened in the fourth case which I have related.

But the most frequent situation of the abscess is before or by the side of the psoas muscles, from whence the fluid collected sometimes extends itself laterally, and making its way between the three strata of abdominal muscles presents itself beneath the integuments of the abdomen. These abscesses are gene-

rally regarded as less dangerous; perhaps the complicated course which they pursue prevents the ready propagation of inflammation to the original cavity after they have ruptured or are opened.

But the gravity of the matter, and the yielding state of the cellular substance generally determine it to descend with the psoas muscle beneath Poupart's ligament, in which situation it elevates the fascia of the thigh. This is the most common progress and presentation of the lumbar abscesses.

Some cases are on record where the matter has descended in the cavity of the pelvis, and through the upper part of the obturator foramen, or through the great sacro ischiatic foramen, or has protruded the integuments by the side of the rectum. Such is the original situation, and such the various presentations of the matter of a lumbar abscess, which I believe very rarely causes any disease of the adjacent bones.

That pus may be collected in the loins, in
con-

consequence of carious vertebræ, that it may accumulate, extend, and present itself like a lumbar abscess, is, I believe well known; but here the disease is complicated. When such an abscess bursts, the patient's life is in imminent danger; his constitution is now obliged to encounter all the irritation attending an inflammation of a very extensive cyst, and to support a copious, and constant purulent discharge, at a time when it has been enfeebled by a prior and very considerable disease. I have, however, seen patients escape the immediate hazard arising from the rupture of such an abscess, I have seen them with openings in the thigh discharging matter, when the vertebræ have been carious, and the limbs in consequence palsied.

To these cases the practice which I have proposed seems peculiarly adapted. The accumulated matter would probably make a spontaneous outlet, and the destruction of the patient would be the almost inevitable consequence. But the temporary evacuation of matter which I have recommended, obviates distention and prevents this effect. Whilst
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the art of the surgeon is employed in remedying the cause which produced the matter; in detracting from the disease of the corpora vertebrarum by external derivation by issues made in the back, of the utility of which means we are assured by long continued experience.

I believe I cannot give a more useful or intelligible account of these diseases than by tracing them through their various stages, and by remarking the symptoms, and treatment appropriate to each. These complaints present us with a specimen of languid chronic inflammation, terminating in an abscess. Sometimes this is effected with little pain, and though the patients usually complain much, during the continuance of the inflammation, yet their sufferings are by no means so severe, as those, which attend on a phlegmon. Both the rapid and violent inflammation, which is called phlegmon, and this more languid and chronic inflammation may terminate in suppuration, and produce an abscess; but the circumstances of the surrounding parts are very different, and to these I wish for a short time to direct the attention of the reader.

In phlegmonoid tumours the violent inflammation which causes suppuration in the center gradually abating in the circumference, occasions there, adhesion and thickening of the cellular substance ; so that there are two causes of the confinement of pus in a plegmonoid abscess, viz. condensation of the surrounding cellular substance, which is the consequence of the pressure of the collected matter ; and a thickened unnatural state of that substance which the effect of the degree of inflammation, that it has endured. When, therefore, a phlegmonoid abscess is opened, although, as is well known, the sides will greatly approximate to each other, and the cavity will be much diminished ; yet, the contraction will be less complete on account of the diseased state of the sides of the abscess. But if the abscess be the consequence of chronic inflammation, the surrounding partake very little of the disease ; these, therefore, are but little altered from their natural state, and the collected pus is confined almost solely, by the condensation of the surrounding substance into a cyst. It therefore appears that the recommended practice is particularly adapted to these cases ;

cases ; as when the evacuation of the matter diminishes the condensing cause, the surrounding cellular substance is likely, in some degree, to regain its original rarity and looseness of texture, and thus greatly to diminish the cavity of the abscesses.

In abscesses, formed in consequence of acute inflammation, as the surrounding parts partake of the affection, those which intervene between the matter and the surface of the body, soon inflame and ulcerate, and thus the collected pus quickly obtains a spontaneous outlet. But in the chronic abscess the surrounding parts have little disposition to inflame, and the approach of matter to the surface is therefore much more tardy. When it descends, as usual, beneath the fascia of the thigh, there is an additional cause, why the skin is not readily affected ; the matter confined beneath the resisting fascia cannot irritate it by its pressure.

I will relate the case of a woman who was late in the hospital, as it well illustrates all the circumstances of the formation and progress of these chronic abscesses. An accumulation of

of twelve ounces of well-formed pus happened beneath the integuments covering the upper part of the pectoral muscle; it had elevated the skin, and had formed a globular kind of tumour. This suppuration had been attended with scarcely any pain, and the integuments, although distended, were indolent, and appeared perfectly healthy and natural. I punctured the abscess with a lancet conveyed obliquely between the integuments and the cyst, evacuated the contained pus, and closed the aperture with sticking plaster: but on the re-accumulation of matter it was no longer confined in a cyst, but had diffused itself through the cellular substance leading to the axilla, in which inflammation was produced. I was, therefore, obliged to make a new orifice, and leave it open, that the secreted matter might have an outlet, and not extend disease, by thus pervading the cellular substance.

The lumbar abscesses generally occur in unhealthy subjects, but they sometimes are found in people who possess considerable strength. Any thing which can induce inflammation in the cellular substance may give rise to them. Their origin is often to be

traced to accidental colds, to strains, and to febrile diseases inductive of inflammation. Doubtless the inflammation is sometimes more acute, sometimes more languid, as the producing cause, and the constitution of the patient determine. If matter be once formed its presence produces an increase of disease, it presses on and gently irritates the surrounding parts in a manner likely to perpetuate this chronic inflammation. In consequence of such irritation more matter is deposited; and the greater the accumulation of pus the greater is the stimulus to the surrounding parts, and thus the disease is augmented.

Pain in the loins is the common attendant on fever, and on weakness, when no inflammation is present. This circumstance, perhaps, makes us too little attentive to such complaints, from our patients. An inflammation may at a certain period have begun, it may now be checked, and many a lumbar abscess might probably be prevented by timely attention. The means by which this purpose is to be accomplished, either operate on the constitution, or on the affected part. The former

former comprehends such evacuations from the circulating system as the strength of the patient will permit, and other means which it would be unnecessary to mention since they are familiarly known to every surgeon. Of local treatments, scarifications, blisters, and setons in the loins, promise advantage by deriving inflammation to the surface.

Confinement to bed and perfect quietude should be enjoined. Whenever the patient sits up, or puts his thigh in action, the inflamed parts must be injured by motion. An impediment to the motions of the thigh does in some degree indicate the presence of inflammation in the loins, and a consequent affection of the psoas muscle. This symptom often goes off when suppuration is formed, but frequently the inability to bend and to turn the thigh outwards remains during the greater part of the continuance of the complaint. As motion is painful and must aggravate inflammation, quietude of the thigh is evidently very proper in every stage of this complaint. M. David in France, and Mr. Justamond in England, have particularly extolled its utility.

Such are the usual symptoms which denote the formation of a lumbar abscess. I have already noticed the means by which we ought to aim at its dispersion, and I have attempted to shew that the presence of matter is the cause of its accumulation.

Let us now suppose that no efforts on the part of the surgeon could have prevented the formation of an abscess. Let us suppose that the collected matter has descended in the course of the psoas muscle beneath Poupart's ligament, and now presents itself beneath the fascia of the thigh. The symptoms which then characterize the complaint are, the discovery of a fluctuation in the tumour;—the absence of pain in the part, which shews that the fluid was not formed therein;—the intelligence that the patient affords of the pain which he had previously suffered in his loins; and the forcible impulse of matter from the loins into the tumour, which is perceived whenever the patient coughs.

4. Before I proceed to relate the conduct which I should then pursue, I shall endeavour to investigate

vestigate the cause of that derangement of constitution, which succeeds to the ordinary mode of evacuating the matter from a lumbar abscess; for could this be determined, the most rational means of preventing it would be immediately indicated. This, therefore, is the first point which I shall endeavour to ascertain. The fever, which is excited, appears to be subsequent to the local inflammation, and corresponds, in degree, to the disease existing in the part. It has been generally observed, that where the abscess has spontaneously burst, or has been opened with the least possible degree of irritation, if fortunately but little topical inflammation was produced, the derangement of the constitution was small in proportion.

Our first enquiry will therefore be, to what cause we ought to attribute this local inflammation. Surgeons formerly were accustomed to ascribe it almost entirely to the admitted air, which they supposed to act by powerfully stimulating the cyst of the abscess; and also by producing putrefaction of the contained pus. This putrifying matter was also sup-

posed to act in a twofold manner; first, by irritating and aggravating the inflammation of the contiguous parts; secondly, by being absorbed and conveyed into the circulating vessels, where by its stimulus it occasioned the fever concomitant to the complaint.

These, I believe, are the principal opinions that have been maintained: I wish now to enquire into their truth or fallacy. First, then, is the admitted air capable of so greatly stimulating the cyst of an abscess? and here our enquiry becomes extended: the question may be stated—Does the air admitted into the different cavities of the body cause that inflammation which ensues when they are laid open? or ought we rather to attribute it to the irritation produced by the inflicted wound? Surgeons were formerly inclined to impute very mischievous effects to the entrance of air into cavities: they seem to have imagined it possessed of very deleterious powers. This opinion appears strange, since it is very little stimulating to the animal fibre; and that it does not particularly irritate the membranes of the body, common observation and experimental

mental enquiry have evinced. Air is admitted into the cellular substance in Ephysema, in which, however, it produces no inflammation. Mr. Ashley Cooper permits me to mention the result of experiments which he made, in order to determine how far the air was stimulating.—He inflated the abdomen, thorax, and cellular substance of dogs, and immediately closed the aperture through which the air was impelled; the wounds healed by the first intention, the air was absorbed from the cavities, but no inflammation was excited.

The circumstances, however, are different when the opening is permanent; a constant renewal of air is permitted; and the application of a matter so unusual to these surfaces I am inclined to believe does harm. Whenever the integrity of the cyst is destroyed, though by spontaneous ulceration, or by means productive of the least possible irritation, still much inflammation frequently ensues; for where ulceration of the cyst takes place, little, if any, inflammation is perceptible until the discharge of the pus has hap-

pened :—and when a caustic has been applied to the tunica vaginalis testis, for the cure of the hydrocele, though that membrane has suffered all that it can do from irritation, yet, the severity of the symptoms is always greatly aggravated when the sloughy tunic has ruptured. Whether the unsupported and collapsed state of the cyst is the cause exciting inflammation,—whether this action is occasioned by the sensation of imperfection in the part,—or whether it is owing to the irritation of the admitted air, may be left as matter of opinion ; I am only solicitous to state, that an inflammation appears to me to take place, independent of the local stimulus of the wound.

The next opinion that I have to notice is, whether the admitted air may not do injury by inducing putrefaction of the pus ? If the matter had only an incomplete discharge, it was confined in a state of putrefaction, and thus applied to the surface of the abscess, it surely would be, in some degree, injurious ; but as the outlet in general is sufficient, and as the former matter is washed away by that which is newly secreted, this is not likely to be

be a common occurrence. I here beg leave to remark, that some confusion appears to me to have arisen from the word putrid being used occasionally to signify both fœtid matter, and matter in a state of putrefaction;—but putrefaction is owing to chemical decomposition of the animal substance, and matter thus circumstanced cannot fail to irritate the animal fibres.

On what the odour of newly secreted matter depends is not well known, nor does it follow of consequence, that because it is disgusting to our senses, it is stimulating to the surface which secretes it. The fœtor, surely, denotes a deviation from its usual properties; and, therefore, probably, it may be capable of irritating the surrounding vessels.—But the degree of irritation we are induced to believe is not great, from observing that ulcers continue for a long time to discharge putrid pus, whilst their surface appears little affected by the qualities of the secretion.

It has been generally remarked, that where there is little irritation consequent to the opening

opening of the abscess, in general, little *fætor* of the discharge is perceived ; it appears probable, therefore, that the unnatural qualities of the secretion depend on the local excitement of the vessels.

The third point for enquiry is, whether the absorption of this putrid matter produces hectic fever ? Before this question can be discussed it ought to be stated, whether putrifying or *fætid* matter be meant ? We daily see instances of people having copious discharge of *fætid* matter from ulcers, who do not suffer hectic fever. If matter which is injurious be absorbed, the absorbents are first stimulated, and inflame ; and when that matter enters the circulating system, it excites fever by its stimulating properties :—but this is not heitical ; it is more violent, more approaching to the nature of inflammatory fever. Now, as there are no symptoms indicating inflamed lymphatics,—as the fever is of a different nature,—and as we have daily instances of large surfaces secreting putrid pus, without the production of fever similar to that attendant on lumbar abscess, I conclude that

that the absorption of matter is not, generally, the cause of the fever which succeeds the ordinary evacuation of the lumbar abscess. To what origin, then, are we to impute this local and general irritation ?

There are two causes which seem to induce the topical inflammation. 1st, An irritation extended over the whole cyst from the part wounded or ulcerated.—This is, generally, proportionate by the injury done to the cyst : a knowledge of this circumstance shews the great impropriety of much injuring the cyst, by extensive incision, or the application of caustic. 2dly, Great inflammation sometimes occurs where the local irritation is not considerable. The cause of this I have endeavoured to investigate ; and in our treatment of these complaints we should endeavour to avoid those circumstances likely to induce it. There is also a third circumstance very injurious to the health of the patient, which is, a copious and exhausting discharge from an extensive cyst.

The fever appears to be a sympathetic affection

affection of the circulating system with the local discharge. It is more violent during the first stage of local inflammation ; and is continued, though moderately, from the exertion and debility attending the production and continuance of the discharge from the cavity of the abscess.

The method which I have pursued appears to me well calculated to obviate all the injurious consequences subsequent to the evacuation of a lumbar abscess. The matter is by this method discharged ; and, as the wound made in the cyst immediately unites, inflammation is prevented :—neither does that inflammation ensue, the cause of which, it is difficult to assign, but which appears to me independent of the irritation of the wound inflicted in the cyst. The general circulation also remains undisturbed. It is natural to suppose that the secretion into the abscess would, in some degree, increase the patient's weakness ; yet, scarcely any alteration is perceptible. When one of these abscesses held three pints of pus, the loss of fluid from the system was generally in the first fortnight

twelve ounces; in the second, between six and seven ounces; in each succeeding fortnight, about four ounces. In about six weeks, as no matter is impelled by the dis-united fascia when the patient coughs, I conclude that the original abscess of the loins is nearly abolished, in consequence of the disposition of its sides to contract, when they are not kept asunder by collected fluids. And that no repletion of the abscess is likely to happen, evidently appears, for whatever secretion is made into it, will, by its gravity, descend into the cavity left by the separated fascia of the thigh. Thus is the reduction of the abscess, to a very considerable extent, accomplished, without irritation or debilitating exertion of the vascular system. Neither is the loss of fluids which I have stated, to be compared to the profuse quantity drained off from the circulating system, when inflammation is produced and secretion greatly increased, in consequence of the abscess being immediately laid open. I also think it probable that the violent inflammation which is thus induced, thickens the cyst, lessens its elasticity, and prevents that speedy contraction which

which I believe happens when its inflammation is obviated by the means I have related.

A knowledge of the dreadful consequences attending the ordinary mode of discharging the matter made surgeons delay, as much as possible, to open these abscesses. The quantity of pus was therefore suffered to encrease till it had very extensively detached the fascia, and until the dimensions of the cyst in the loins was much enlarged. This practice is evidently injurious; the longer the opening is delayed, the greater does the accumulation of matter become, and the more extensive must be the containing cyst,—in proportion to its extent, so will be the succeeding inflammation and discharge. I have little doubt but if every psoas abscess had been opened on its first appearance fewer people would have died of this complaint. When such an abscess first presents, perhaps, it may contain eight ounces of pus; yet I have seen a case where the fascia was tense and did not readily admit of protusion; in which one-third of it was detached from the subjacent parts, and the abscess contained forty ounces of fluid before the

the tumour became so prominent as to demand of the surgeon to give discharge to its contents. The skin will retain its natural appearance, because it is not distended by the matter,—the fascia sustains all the pressure. If the pus be not evacuated, the quantity collected beneath the fascia must increase. The same observations apply to matter originally formed beneath the fascia, which must be discharged early, if we wish to prevent the increase of disease. The fears of exciting dangerous fever has been the cause of delay; but by the method here recommended the matter may be discharged and the dimensions of the cavity reduced without such apprehensions. After having two or three times punctured the fascia and discharged the matter, no fear I think, in ordinary cases, need be entertained of leaving a permanent opening in the cyst of the abscess, and thus inducing that inflammation which is necessary for its final closure. I scarcely need observe, that where the tumour is small, care is required in the introduction of a lancet beneath the fascia, least the large vessels be injured, doubtless the opening

opening should be on the one side, and not opposite to these vessels.—

5. I now wish to represent to the reader the manner in which I propose to treat ordinary cases.—I at first tapped them with an hydrocele trochar; but I found on the redistention of the fascia the pressure against the orifice induced it to inflame and ulcerate. Although this never happened but in one case, as I have related, yet, I was fearful of it in others. In that case, the second discharge of matter was too long delayed, so that the distention of the fascia became very considerable.

I prefer discharging the pus by introducing a lancet through the integuments, then passing it obliquely for a small distance between the skin and fascia, and then by depressing the point of the lancet to puncture the cyst.

When a trochar is introduced, the orifice of the cyst is opposed to that of the integuments; the opening through which the trochar

trochar has passed is filled up by newly formed vascular substance: when distention takes place, and this substance is pressed upon, we know that it will more readily ulcerate than parts originally formed, and, therefore, there is danger of its giving way from pressure; but when the cyst is punctured in the manner which I have described, the pressure is exerted against the original cyst, and not against a newly formed substance.

If the lancet be introduced too obliquely, the orifice in the integuments will not correspond with that of the cyst, and the discharge of the pus will be difficult, particularly if there be mixed with it flakes of firmer matter. In that case I think a flat trochar should be introduced through the wound. The canula should be of a sufficient size to allow the passage of any flakes of firm substance which may be contained in the matter; for the introduction of a probe through the canula, to remove such obstructions, is obviously injurious; it may stimulate the cyst, and admit air into the cavity of the abscess. The mat-

ter, if possible, should be drawn off in an uninterrupted current; and the aperture should be immediately, and exactly, closed. It might be said that the canula could be introduced without the stilette; but this, perhaps, cannot be effected without difficulty: every degree of force should be avoided, and the utmost attention paid, that the cyst should not be irritated. I should object much to the introduction of probes or directors through the orifice, in order to expedite the flow of the matter; if the opening made by the point of the lancet be too small, I would rather enlarge it, than risk the production of inflammation of the cyst by such irritation.

The complete evacuation of the abscess seems indispensable in the prosecution of this plan of conduct; for if the matter be but partially discharged, re-distention of the cyst will soon happen, and ulceration of the punctured part will be inevitable, if an outlet be not given to the accumulated fluid. I have usually dressed the orifice made by the lancet with lint, whilst its edges are brought into close

close contact with sticking plaster, as we commonly treat the wound made in venæction. I think it better to make this incision in a longitudinal direction with regard to the thigh ; for it appears less likely to be burst open by the exertion of coughing. Much attention to procure the immediate union of these punctures is requisite, as upon this circumstance depends the success of this mode of treatment. I have generally postponed the second discharge of pus for a fortnight ; but if the cavity soon fills again, and the newly-healed punctures are irritated by the pressure of the contained fluid, there is an absolute necessity for evacuating the contents of the abscess at an earlier period.

The advantages of the mode of treatment which I have pursued and recommended in these complaints appear to me strikingly evident ; yet, I do not expect that in all cases our intentions can be accomplished. The exertion used in coughing will sometimes impel the matter through the puncture, and prevent its immediate union ; sometimes inflammation of

the cyst, and ulceration of these orifices, may happen. But if the original plan of treatment has been frustrated, the conduct which has been pursued is, still, the best possible to be practised:—the matter has been evacuated by a small wound, and with the least possible degree of irritation to the cyst of the abscess; consequently, the succeeding inflammation and fever will probably be small in proportion. Since the former part of this Essay was printed, a case has occurred which proves the truth of these opinions.

C A S E.

A man was admitted into the hospital with a large lumbar abscess. I punctured it obliquely with a lancet; but the matter not discharging freely, I introduced a trochar through the orifice, and evacuated thirty ounces of pus. In consequence of violent exertion in coughing, some matter was the succeeding day impelled through the orifice; the puncture was again carefully dressed, in hopes that it might still heal, and for some days the

event was doubtful ; but the man, in getting up, had twice displaced the plaster. On the fifth day, an inflammation of the integuments and induration and tenderness of the fascia, were evident : the patient also complained of pain when the tumour was slightly compressed.

The present object of surgery was I thought, to lessen as much as possible the irritation of the punctured parts, that the stimulus imparted to the cyst from that cause might be proportionably diminished. I directed a poultice to be applied to the part, from which he obtained much abatement of pain : on the following day he did not complain, the tumour was, comparatively, little sensible, and soon after became indolent. However, much irritation, both locally and generally, succeeded ; the discharge was copious and fœtid ; and the fever hectic,—it prevented his sleeping, and induced great debility. After about ten days, the severity of the fever diminished, and his strength began to return. I forbear to detain the reader with a recital of every circum-

stance—it will be sufficient to say, that the severe illness which he has endured, the extreme debility occasioned by the fever and discharge, and the length of time to which his cure will probably be protracted, yet more forcibly impress my mind with the conviction of the advantages derived from this mode of treatment; by which the cure of such an abscess has been accomplished in less time, and without the production of inflammation or evident fever.

I have thus taken the liberty of offering to the public my observations and sentiments respecting these abscesses: I have not interrupted the account by remarking in what they vary from the opinions of others; but I now beg leave, briefly, to point out these differences.

i. The prevailing opinion has been that the matter originated from a disease of the spine. This is directly contrary to the information which I have derived from dissection; and were the idea true, it would surely be

strange, that in nine succeeding cases, to which I was particularly attentive, there was not the least reason to suppose that any such disease existed. That disease of the vertebræ, when it exists, may irritate the adjacent cellular substance, and induce suppuration, is very probable ; and, therefore, it cannot be surprising occasionally to find the two diseases concomitant. Where there is the greatest quantity of loose cellular substance these abscesses, which, perhaps, are more the product of constitutional indisposition than local irritation, generally form. Of this nature are the abscesses which take place in the cellular substance surrounding the rectum, and which afterwards contract into fistulous tubes. These cases are, in my opinion, somewhat analogous ; yet, in the latter no one ever suspected a caries of the adjacent bones.

2. Perhaps, the idea which I have formed of the nature of the cyst of these abscesses may not accord with the general opinion. The case which I have related, and diffusion of the pus after the evacuation of such an abscess,

which is no uncommon occurrence, are the arguments on which my opinion is founded ; and they appear to me sufficient for its support.

3. The propriety of speedily opening most chronic abscesses, though contrary to general practice, appears to me obviously proper. In phlegmonoid abscesses a spontaneous outlet to the collected matter is speedily afforded by the extension of disease ; but in chronic suppurations this natural opening is very long protracted, and the disease, in consequence, augmented.

Perhaps, this mode of diminishing cavities, by occasionally evacuating their contents, may be applied with advantage to other cases in surgery. In the only case of chronic abscess in which I tried this practice, inflammation ensued in the surrounding cellular substance, when the matter became diffused : but I do not think it is likely to happen in other cases.

As the design of this treatment is merely to diminish

diminish the extent of an abscess, I think it will not be found applicable to collections of matter beneath the fascia of the thigh; for the extent of the detached fascia cannot be much diminished. I should propose in such cases early to discharge the collected matter, by means as little irritating as possible to the surrounding parts: for the effect of much inflammation is a profuse discharge, which often greatly exhausts the constitution. Having thus avoided immediate inflammation, we should next endeavour to procure an union of the separated parts, and to effect such a design I think, together with the use of bandages, we are then vindicated in employing stimulating applications.

I submit to the reader whether a mode of treatment similar to that which I have related may not be sometimes proper in cases of spina bifida. The reason of the accumulation of fluid in these diseases beneath the Dura Mater is not very apparent; nor does the cause producing the secretion appear to be powerful or constant; for the water collects very slowly at first, and in some cases none has ever

ever been effused, and the child has grown up without experiencing any inconvenience. When once the collection has begun, the cause of its continuance and increase is evident ; the collected fluid irritates and distends the membrane which secretes it, and thus augments the disease. I do not know that any attempts have been made to remedy these complaints ; but I see no reason why we should forego all endeavours. I think it very probable that a gentle degree of pressure made on the tumour from birth, or at its commencement, might produce the absorption of any deposited fluid, and thus prevent the distension of the unsupported Dura Mater.

It has been an opinion, too generally adopted and inculcated, that the imperfect formation of a part so essential to the animal, implies a deficiency of power in the constitution. This reasoning appears to me fallacious. Want of vigour of constitution might cause debility in any part, but could not cause an error of formation. I have seen very healthy infants who have been thus imperfectly formed, and whose

whose health has sustained but little derangement till the tumour has burst, when they have perished from the inflammation of the Medulla Spinalis which inevitably ensues.

Surely, some attempt ought to be made to repress this collection of fluid : but even if it should have begun, I would still think it right to endeavour to produce its dispersion, by the application of gentle pressure. If this should have no effect, and should the accumulation of fluid continue to increase, as the death of the patient would be inevitable on the spontaneous rupture, I think it would be vindicable to discharge the fluid by a puncture with a finely cutting instrument, and endeavour to heal the wound immediately ; and should this be accomplished, to attempt to repress a future collection, by bandage, or by those topical applications which appear best adapted to this purpose.

A N

E S S A Y

O N T H E

COMPOSITION AND ANALYSIS

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A N I M A L M A T T E R.

MR. Boyle hath shewn by experiment, that vegetables will grow, and will produce a woody vegetable substance when in contact only with air and water : now, as pure water is a compound of two airs, the solid fabric of vegetables must be a modification of the same particles of matter, which might previously have existed in an aeriform state.

Some observations have made it appear probable, that even animal matter may, under certain circumstances, be formed of similar
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ingredients. The stationary life and growth of marine zoophites induce us to this opinion, their sustenance appearing chiefly, if not entirely, to be derived from the surrounding air and water. At certain seasons of the year, immense shoals of fish transport themselves from one part of the ocean to another; the foremost would surely devour all the food which they might accidentally meet with; yet those which follow do not seem to suffer from deficiency. However, it may be remarked that animals of this nature do not need that constant renovation of substance which those of warmer blood require: yet still the long abstinence they undergo, without adequate diminution of bulk, appears to confirm the opinion.

Dr. Fordyce, in his Treatise on Digestion, says, that he has put this idea to the test of experiment: he kept gold fish for six months in distilled water, during which time they grew.

Believing that, if this supposition of the formation of animal matter could be proved

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to be fact, it would render our knowledge of its composition and analysis clear and simple; and foreseeing that some curious deductions in chemistry would follow its establishment, I sought to ascertain or refute the opinion by the following experiments. I first resolved to repeat, in different ways, the experiments of Doctor Fordyce; yet I soon perceived that experiments thus conducted could not be conclusive. I shall only present the reader with a general sketch of what was done on this plan, as it were unnecessary and improper to relate with accuracy every circumstance of indecisive experiments.

EXPERIMENT.

I placed some frogs spawn in a large earthen pan, with plenty of clear river water; and when the tadpoles had extricated themselves from the viscous matter of their ova, I removed them into distilled water; they were about two hundred in number.

At first the distilled water was renewed once a week, but afterwards it was merely filtered: the

the pan was placed in a garden and covered with moderately fine linen ; however, any covering, which did not exclude the air, was insufficient to prevent the admittance of the ovulæ of minute vegetables and animals ; each week, when I filtered the water, I separated from it abundance of dark-green vegetable matter, and great numbers of animalcules were left struggling on the filter. The presence of these were not so defective of the intention of the experiment, as at first sight, might be imagined ; for, excepting only the imperceptibly small quantity of matter contained in the ova, these insects and vegetables grew from pure air and water alone ; so that admitting the tadpoles fed upon these, they still were supported by a modification of air and water. Many of the tadpoles died, and the others, I believe, fed on them : those that died were however separated from the others, weekly, by filtration.

I observed that the tadpoles were not, as in common, restlessly seeking for food, but lay quietly at the bottom of the vessel, unless disturbed ;

disturbed ; yet, when the vessel was shaken, they swam with much vivacity. This experiment began on the 19th of April, and on the 21st of June I counted forty tadpoles, many of which were in a state of transformation, and four perfect frogs. Their number now quickly diminished, for, after having undergone this transformation, they either died or escaped from the pan ; had they died their remains would have been visible, yet none were discovered. I did not suppose they could have climbed up three inches height of a glazed pan, yet this they doubtless accomplished.

EXPERIMENTS.

The following year I took twelve leeches, which weighed ten scruples, and put them into two gallons of distilled water, in a glafs jar. I covered the jar with two layers of paper, and pricked holes in the cover with a pin, to give admission to air. I never filtered this water, but suffered the leeches to remain in the same state for three months. Much vegetable matter had grown in the jar during

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that time. When I then examined them, eight only were living, but these weighed twelve scruples; so that the weight of the leeches had encreased, although their number was diminished.

I also caught some small tadpoles, which weighed two drams and one scruple. I put them in a similar bottle and covered them in the same manner as the leeches; they lived, but did not appear to grow; at the end of a month three were found dead, and the remainder weighed one dram and one scruple. These experiments were made in London.

The impossibility of excluding the ovulæ of animals and vegetables from water, must, I think, always make these kind of experiments indecisive. The conclusion which I have drawn in my own mind, from these and from future experiments, is, that the less perfect animalcules are capable, like vegetables, of converting mere air and water into their own nature, and that animals of a still higher order may derive occasional sustenance from the same materials;

ANIMAL MATTER.

materials ; yet, as nature probably designed them to be supported by already prepared animal and vegetable matter, the sustenance which they derive from mere air and water is imperfect, and inadequate to their continued support.

The experiments which I made upon this plan were all executed during the summer season, the prevention of vegetation was then impossible ; for, when I attempted to obviate this circumstance by closing the bottle, even the leech, the most vivacious of these animalcules, quickly perished. In the winter, perhaps, vegetation might cease ; but then, the torpid and little varying state of the animal body would, I think, render the experiment indecisive.

It has been long well known, that vegetables will grow when in contact only with pure water and air. I do not, however, know that their analysis has been attended to. Mr. Boyle indeed says, that they yielded a spirit and a *caput mortuum* ; but the extent of chemical

knowledge in his time, did not enable him to investigate this subject, as he would have wished. I was desirous to know if vegetables thus procured would yield the same substances as are afforded by the decomposition of common vegetables; for if from these we can obtain vegetable alkali, lime, iron, and charcoal, it follows, that these substances are only varieties of arrangement of the same particles of matter, which previously existed in the state of air and water. To ascertain this circumstance, I made the following experiments.

EXPERIMENT.

I strewed the seeds of cabbages on thin clean flannel, spread on glazed earthen plates, and each day sprinkled them with distilled water; the seeds soon began to vegetate, and the young plants grew as speedily and vigorously as usual. After five weeks I mowed off the young plants from the seeds and roots. I took nearly two ounces of these young plants and reduced them to ashes in a crucible; they yielded eight grains of whitish ashes; this was a smaller proportion of fixed residue than what I ob-

obtained from common vegetables, for six drams of common cabbage-leaf yielded when burned, five grains of ashes. To the eight grains of ashes half an ounce of distilled water was added, and gently heated; upon dipping some paper, tinged with the vegetable blue into this liquor, it instantly became of a bright green. The water being poured off, one dram of marine acid diluted was added, which produced a gradual long-continued effervescence; this being filtered was divided into two equal parts, to one portion the prussicated alkali was added, and a very copious precipitate of prussian blue was produced; the other portion was supersaturated with caustic vegetable alkali, and a very plentiful flocculent precipitate of lime was caused: still some fixed residue remained, which doubtless was charcoal.

To this experiment it may be objected, that the vegetables derived the substances which were discovered on their analysis, from their seeds, or from the flannel on which they grew. A quantity of seed equal to that which

produced these plants, being burned in the same fire, left too small a quantity of ashes for examination: neither is it likely that the flannel should be decomposed by the growth of vegetables: however, should any experiment of this kind be in future attempted, I think it would be better to grow the vegetables, if it be possible, on sand, which had been previously well washed with marine acid, by which it would be freed from accidental admixtures.

EXPERIMENT.

I took six very small sprigs of mint, which weighed thirty grains, and put them in phials filled with distilled water in a hot-house. Roots shot from them in plenty, but the stem and leaves grew very scantily: it was in the autumn when probably their power of vegetation was diminished. When the roots had filled the bottles I removed them and burned them in a crucible and obtained eight grains of ashes. Thirty grains of similar sprigs of mint had been previously consumed, and had left too small a residue to admit of examination. To
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the eight grains of ashes thus obtained, some distilled water was added, and gently heated. This liquor instantly changed the vegetable blue to a deep green colour ; thirty drops of marine acid, diluted with distilled water, was now added, which being filtered, was divided into two equal portions : one part being saturated with caustic vegetable alkali, a flocculent precipitate of lime was deposited ; and the prussicated alkali, being added to the other, a considerable quantity of prussian blue was produced. Some ashes still remained undissolved by the marine acid : these I conclude are charcoal.

This experiment is not liable to the same objections as the preceding one, here the vegetable matter could only be produced from air and water, yet, when analysed, it yielded the same products as other vegetables. It may be questioned if the marine acid which I used was pure, and the tests which I employed were good ; it is therefore right to mention, that I mixed the same proportions of marine acid and prussicated alkali as were used in the experi-

ment, and though a slight blue colour was exhibited, the appearance was very different to that copious blue precipitate which was thrown down from the acid which had stood in the vegetable ashes. Neither was any precipitate caused when the marine acid was supersaturated by the vegetable alkali.

Every one knows how readily mint grows in common water, and few people, I believe, will doubt, that this mint when analysed, will yield vegetable alkali, lime, iron, and charcoal ; yet, surely the water does not contain these substances in such quantities as to impart them in a ready-formed state to the vegetable. Some authors have questioned whether the alkali formally exists in vegetables, or whether it is produced by their decomposition ; to investigate this subject I made the next related experiments.

I took six drams of cabbage-leaf, and added one ounce of strong marine acid ; after it had stood two days I strained off the acid and burned the remaining leaf, and obtained four grains

grains and a quarter of whitish ashes. To these three drams of distilled water was added, the vegetable blue was not changed by this liquor; the water became, however, salt to the taste, and, on evaporation, left about half a grain of saline chrystals; twenty drops of marine acid diluted was added to the remaining ashes, half of which being saturated with caustic vegetable alkali, an evident precipitate of lime followed: and ten drops of prussicated alkali being added to the remainder, a deep blue was produced: still some charry matter remained undissolved by the acid.

Equal quantities of strong marine and nitrous acids were suffered to stand some days on fresh parsley, but they took up neither lime, iron, nor alkali; some of the same parsley reduced to ashes by heat yielded abundance of these materials. There is surely nothing in the mild juices, and delicate texture of vegetables, which could protect these substances if already formed from the attraction of such potent menstrua. If these substances are formed by the decomposition of vegetable matter,

matter, it is clear, that they are not elementary or unchanging, but only varieties of arrangement and motion of the same atoms, which differently combined formed a vegetable, and which might previously have existed in the state of air, or water.

EXPERIMENT.

I was desirous to know if an animal would live and grow when fed only with vegetables, which had been produced from air and water. I therefore procured two rabbits, six weeks old, the produce of the same mother, one weighed twenty-three ounces and a half; this I killed and analysed: the other weighed twenty-three ounces, which I fed in the following manner. Having obtained a large quantity of young cabbages and lettuces, which grew on flannel and were only sprinkled with distilled water, in the manner before related; I mowed off the tops and gave them for food to the rabbit. On the third day after he had fed on them, he appeared very ill; he breathed very quick, and his hair was ruffled; he was also purged: fearing that he would die, I gave him

him a few shelled oats, still leaving a plate with these vegetables before him. Next day he appeared much better and had eat both the oats and greens. For four succeeding days he eat a plateful of the fresh vegetables, and a small quantity of oats, he appeared thin but was very lively: he only eat two ounces and a half of oats in the week, a quantity, I think, very insufficient to support him in the state he appeared to be, had not the vegetables contributed to his nourishment. I was now obliged to go into the country for a few days, the rabbit was therefore fed for a week with common cabbage-leaf and parsley. After this I fed him for a fortnight in the former manner, allowing him scarcely any oats; he eat as much cabbage as grew upon six plates each day; he was lively and strong, and though he looked thin, yet he increased two ounces in weight during this fortnight. Deficiency of vegetables obliged me to discontinue the experiment: I did not analyze the rabbit, as I had originally intended, because I thought the experiment incomplete, and I designed to repeat it more extensively the following year. I

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did procure every thing for that purpose, but the garden where I attempted to grow these vegetables was too near to the smoke of London, which prevented their vegetation.

If the vegetables which are thus produced contain the same matter as common vegetables, though in a less degree, there appears no reason why an animal should not be supported by them. Let it be then remembered that such an animal is nourished, only by a modification of air and water, from which his organs are capable of forming the mineral alkali, phosphorus, and every substance which formally exists in the animal body. I have no doubt but that an animal can be thus nourished ; caution is, however, required in the experiment ; for it is probable the vegetables will at first disagree with his stomach. Some other food should then be allowed him, and if the quantity and analysis of that food be estimated, the object of the experiment will not be defeated. If a young rabbit, living on these vegetables, increases one pound in weight, and during the time of this growth eats

eats only one pound of oats ; if the oats on analysis will yield only a certain quantity of lime, iron, and charcoal, and the animal, when analysed, yields a larger proportion of lime, and iron, together with mineral alkali, and phosphorus, than what is produced from this food, or than could have been obtained from that animal before the commencement of this experiment ; it is then sufficiently evident, that the animal body has a power of preparing these substances, or in forming an animal matter, which yields them on its decomposition. Whoever also reflects on an animal being perfectly supported by vegetables, and remembers that his circulating fluids contain abundance of mineral alkali, which the art of chemistry cannot extract from the vegetable ; must perceive, that the animal powers are certainly capable of forming this substance.

The chicken contained in an egg, after incubation, has lime deposited in its bones, has red particles and consequently much iron in its blood, and probably a proportionate quantity of mineral alkali. I wished to know if these substances

substances existed in similar quantity, in the egg before incubation, and to discover this circumstance made many experiments, the results of which were not exactly similar. I should needlessly engross the time of the reader if I were to detail separately the circumstances of each experiment: it will be sufficient that I relate the general results. I ought in this place to mention, that the eggs, and chickens, on which these experiments were made, were all produced by the same hens. A chicken contained in the egg shell, after complete incubation, weighs in general six drams less than the contents of the shell before that process. There is, therefore, more matter emitted, than imbibed, through the shell during incubation.

I reduced an equal number of chickens and eggs to ashes, sometimes in retorts, sometimes in crucibles. On the ashes I digested first some of distilled water and obtained the salt contained in them. In some experiments the quantity of salt found in the ashes of chickens greatly exceeded that found in the

ashes of the eggs; in others it still exceeded, but in a less proportion, and in other experiments the quantities were equal. I next digested marine acid a little diluted on the ashes, which took up the lime and iron contained in them. I precipitated the lime by saturating the acid with the vegetable alkali.

That the precipitate was lime, was proved by pouring on it diluted vitriolic acid, with which it often formed a stone like selenite. The average proportion of lime to a chicken was five grains; but the egg yielded in general scarcely one grain.

On adding to another portion of this marine acid the prussicated alkali a copious blue precipitate ensued, and in quantity so nearly equal from the eggs, and from the chickens, that I could not decide which had the superiority. After this I boiled vitriolic acid on the ashes, expecting by this means to take up any lime which might be combined with phosphoric acid. Upon saturating the vitriolic acid with vegetable alkali a cloud like precipitate

pitate appeared, and, I think, generally in equal quantities, whether it was obtained from the egg or the chicken; but the precipitate was too small in quantity to be weighed. I afterwards heated the remaining ashes with charcoal. Yet still there was a good deal of fixed residue, such I believe has ever been found to remain after chemists have prosecuted to the utmost, the analysis of animal matter.

I also investigated the difference of the substances found in the egg and chicken, by digesting on them immediately strong marine acid; this would certainly take up whatever alkali, lime, or iron existed formally in those bodies. Marine acid also combines with vegetable and animal gluten. The precipitates obtained by saturating the acid were, therefore, not pure and might deceive. I found, however, an excess of lime in the chicken, when thus examined, proportionate to that which had appeared in the former experiments; and also a larger quantity of salt was obtained, but I could not decide which body possessed the superior proportion of iron. After I had fil-

tered the marine acid from the eggs and chickens, on which it had been digested, and washed the residues with distilled water, I consumed them in crucibles, and still obtained from the ashes which remained, more lime, iron, and salt.

This circumstance proves to me, that the substances found in the ashes of burned animal matter, do not all formally exist in the mass before its destruction ; but are only new combinations of the same ultimate particles, which under their former mode of arrangement made the animal substance, but which being driven asunder by the repulsive power of fire, are left at liberty to form other modifications of matter.

It is, however, right to mention, that the same results did not always follow experiments similarly conducted ; for after having macerated some lean beef in water, till it had lost all its colour, I digested on it a large quantity of strong marine and nitrous acids. I then washed and consumed the residue, but could

not from its ashes obtain an evident quantity of lime, iron, or salt. This circumstance I account for by observing, that these acids so completely dissolve the animal gluten, that the residue is no longer capable of producing such compounds. Yet the truth of the preceding observation remains established; for if the acids be saturated by an alkali, they will precipitate that matter which they had taken from the animal substance, and it will be found merely gluten, containing neither lime, iron, nor alkali.

Lime, it is evident, exists formally in the chicken in much greater quantities than in the yolk or white of an egg; and to me it appears that it is formed in the process of animalization of the chick. Yet it may be contended, on the contrary, that it may be taken from the egg-shell. In answer to this, I can only say, that the inner surface of the shell appears smooth after incubation, and not as if any matter had been taken from it. I have also taken the shells of eggs, when the time of incubation was nearly expired, and compared them

them with shells before incubation, dissolved their lime in marine acid, and afterwards obtained an equal weight of precipitate from each.

If the ultimate particles of animal matter be the same, and if the various products obtained from it, depend on the accidental combination of those particles : it accounts for the want of uniformity which is observed in the quantity of the substances procured by its decomposition. It also seems probable, that these products will differ as the mode of destroying the original matter varies. It occurred to me, that there would be less fixed residue, when the particles were suddenly driven asunder by the repulsive power of fire, than when they were gradually separated by spontaneous putrefaction : in which process, they would for some time remain within the sphere of each other's attraction.

EXPERIMENT.

It being requisite to bleed two persons, who had suffered accidental injury, but

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who in other respects were healthy ; I caught in a common crucible five ounces of blood from one of them, and four ounces from the other ; an equal quantity of blood from the same people was collected in another crucible. The blood contained in the one vessel was immediately decomposed in a moderately strong fire, and yielded five scruples and two grains of ashes.

The other crucible was carefully covered, and hung up in the corner of a chimney ; where it was exposed to the varying heat of the fire for four months. Whilst it remained in this situation, I added to it, four different times, three ounces of distilled water ; for had it been suffered to dry, the process of putrefaction would have ceased. At the expiration of four months I put the crucible in the fire, and expelled all the volatile matter from its contents : the remaining ashes weighed only seventy-eight grains. The ashes which I had obtained from the immediately decomposed blood, I had put by in a paper, in a covered gallypot ; the salts contained in them had deliquesced. I now added distilled water to both parcels of
ashes

ashes, and having thus dissolved the salt contained in them, I evaporated the water, and obtained from the first ashes only six grains of salt ; from the latter (the residue of the putrified blood) I procured fifteen grains. Strong marine acid was now digested on each parcel of ashes, which being examined by saturation with the vegetable alkali, and by the addition of the prussicated alkali, it was found that those ashes left by the putrefaction of blood, contained near forty grains of aerated lime ; whilst in the other residue, there was not half that quantity : the former ashes also contained more than twice the quantity of iron, than was found in the latter.

Vitriolic acid was now boiled on the ashes, which took up from each nearly an equal quantity of lime. The residue of the blood, which was immediately reduced to ashes, weighed but a few grains, whilst the remains of that which was suffered to putrify weighed thirty-five grains. The ashes were now mixed with charcoal and put into a strong fire, in which situation they lost much of the weight ; being

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now again examined, it was found that they contained nothing dissoluble in strong acids.

In prosecuting the analysis of animal matter, the nature of the remaining refractory ashes naturally excite attention; it might be suspected that they might contain lime and iron, so combined as to be insoluble in chemical menstrua. This supposition is not probable, for when they are mixed with charcoal, they may be almost entirely dissipated in a strong fire.

These experiments, I think, shew that vegetables and animals possess organs capable of assimilating to their own nature, the matter destined to their nutrition; that the animal powers can prepare salt, lime, and iron, which are found to exist formally in the body; however, the greater part of an animal, or vegetable, is without such substances, yet, when destroyed by fire, its component parts do in general recombine, and thus produce these substances. Since then, animal matter is only a peculiar arrangement of common matter,
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why may not the organs of imperfect animals be capable as well as vegetables, of producing this arrangement? it seems probable that they are capable; but animals of more perfect organization, who possess sensation, and were designed by nature to live on previously prepared animal and vegetable matter; they appear less able to accomplish such conversion, and die ere it is effected, from the derangement of their sensitive organs.

When the substances obtained by the analysis of animal and vegetable matter are once formed, their particles mutually attract each other with such force, that fire, or any artifice employed by the chemist will not decompose them. Yet, though their composition cannot be shewn by analysis, these experiments prove it by synthesis.

I was prompted to undertake these experiments, because it was necessary to give some account of the nature of animal matter, in a course of anatomical lectures, previously to describing its arrangement, in the structure of the

the human body : and also, because I had imbibed the opinions of the great philosophers of this island, who, from reflection and reasoning, were induced to believe, that the ultimate particles of matter were the same, and that the various substances, with which, this world presents us, were only differences in the arrangement and motion of similar particles. The testimony of experiment, appears to me to be now added to the truth of an opinion, formerly supported merely by the suggestions of reason. Whoever also reflects on the wonderful divisibility of matter, will scarcely suppose any essential difference in its ultimate parts.

These experiments, it is true, only extend to those substances found in animals and vegetables ; as the vegetable and mineral alkalies, phosphorus, lime, iron, &c. but if lime and iron can be thus composed, why may not clay and gold ?

The reader will perceive that the train of experiments, which I have related, are similar to

to those by which Mr. Boyle supported the same opinion. But the extent of chemical knowledge, in his time, did not enable him to examine the nature of the ashes, left after the combustion of animal matter : he could therefore only suggest a probable opinion, he could not offer to the incredulous, convincing proofs.

I much wish that these experiments were more diversified and extended : I undertook them only for my own information, and having prosecuted them so far as to convince myself, I desisted from further investigation. An opportunity now presenting, I offer them to the public notice ; because, to me it appears, that the late advancement of chemistry, though it has given us great knowledge of the properties of every species of matter, yet has tended to contract our views ; it has made us direct them to particular objects, and cease to contemplate this beautiful and extensive prospect of matter, and its combinations. The best chemists, M. Lavoisier, M. Chaptall, and M. Fourcroy, either entirely avoid the consideration of the elements of matter, or if they do

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speak of them, they do not seem to advert to, or understand, this beautiful theory.

If the related experiments should be considered insufficient to prove these doctrines, I heartily hope it may excite others to further investigation: so that, if the opinion be true, it may be perfectly ascertained. For I know not any thought, which, on contemplation, can so delight the mind with admiration of the simplicity and power evident in the operations of the Creator, as the consideration, that by different arrangement and motion of similar atoms, he has produced that variety of substances which are found in the world, and which are so conducive to the wants and gratification of the creatures which inhabit it.

E R R A T A.

- Page 25, line 12, *after there add was.*
Page 40, line last but one, *for my read any.*
Page 47, line 20, *after surrounding add parts.*
Page 48, last line but three, *for late read lately.*
Page 56, line 15, *for stimulus read stimulus.*

